

PORCELAIN ELECTRIC INSULATORS
A MANUFACTURING OPPORTUNITY IN GEORGIA

Prepared for
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January 1962

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Foreword

The undeveloped industrial potentials of Georgia's extensive mineral resources are pointed up again by this seventh report to be completed under Project B-209. One of the several facts which makes porcelain electric insulators a profitable prospect for the state is that three of the basic minerals required are mined in Georgia.

As additional data on the state's varied natural resources are analyzed, similar opportunities can be expected to be identified. They will be reported on as quickly as subsequent analyses are completed.

Inquiries seeking additional information on this particular product or on other products of interest to firms considering a southeastern location will be welcomed.

Kenneth C. Wagner, Head
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Summary

A Georgia manufacturer of electric porcelain insulators should be able to gain an additional net profit on sales over northern plants as follows:

1. an increase in net profit on sales of at least 3.3 per cent through labor savings,
2. an estimated 2 to 4.6 per cent increase in net profit on sales through freight savings on the finished product, plus:
3. freight savings on raw material because Georgia is presently the source of three of the basic materials required for manufacture (comprising 75 per cent of the weight of all materials used),
4. savings on fuel costs because of the existence of cheaper natural gas rates in Georgia.

Furthermore, proximity to the southeastern market would permit better customer service and a better sales position, which should increase the producer's share of the southeastern market.

Sales of both high voltage and low voltage insulators in the six-state southeastern area^{1/} in 1960 were in the range of \$5.5 million to \$6.5 million.^{2/} By 1965 they are expected to increase to a range of from \$6.7 million to \$7.7 million. High voltage insulator sales accounted for \$3.6 million of the total, while the low voltage products accounted for the balance.

A national manufacturer with a Georgia plant selling \$2 million worth of insulators annually could expect additional profits of at least \$100,000, and perhaps extra profits of more than \$180,000.

^{1/} Alabama, Florida, Georgia, North Carolina, South Carolina and Tennessee.

^{2/} These figures do not include sales of steatite insulators.

THE SOUTHEASTERN MARKET

Total sales of porcelain electric insulators in the states of Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee in 1960 were between \$5.5 million and \$6.5 million. Sales in 1965 are expected to range from \$6.7 million to \$7.7 million.^{1/}

Based on a survey by the Industrial Development Branch, sales of insulators to private electric utility companies, rural electrification members, the Tennessee Valley Authority, and to electric transformer producers in the six-state area in 1960 total \$3.6 million. High voltage type insulators comprised the great majority of these sales. The remaining sales of \$1.9 million to \$2.9 million were for low voltage porcelain insulators.

Future sales for the high voltage insulators should continue to increase as the production of electric energy increases. No known substitute can meet the insulating capabilities of porcelain products. On the other hand the market for the low voltage type insulator is not expected to increase significantly. In fact, sales of certain types of low voltage items will undoubtedly decrease, since plastic substitutes are expected to infringe on segments of this market.

Although product quality is highly important in insulator sales, a high degree of price competition has developed among the major manufacturers in recent years. Producers attribute this condition to excess production capacity nationally. Because of this price competition, manufacturers are very much interested in methods of lowering their production costs.

The products are distributed primarily direct from the manufacturers to the final users.

^{1/} These figures do not include sales of steatite insulators.

LOCATION OF MAJOR PRODUCERS

Approximately 60 companies manufacture insulators in the United States; the majority of these are located in the Northwest and Midwest. The only producer located in the Southeast is the Knox Porcelain Company in Knoxville, Tennessee.

The major manufacturers of insulators are as follows:

<u>Manufacturer</u>	<u>Plant Location</u>
Insulator Division, General Electric Co.	Baltimore, Maryland
Lapp Insulator Company	LeRoy, New York
Ohio Brass Company	Barberton, Ohio
Victor Insulator Division I-T-E Circuit Breaker Company	Victor, New York

METHOD OF MANUFACTURE

The basic raw materials used to make porcelain electric insulators are ball clay, china clay (kaolin), feldspar, and flint. Other ingredients such as talc and pyrophyllite are sometimes included to meet exact performance requirements.

The clay products are mixed with water to form the "slip" (a suspension of particles in water), which in turn is filtered and dehydrated to form a clay dough. The dough is then either pressed or extruded (or both) to form the parts, which are dried in an oven. The shaping operation -- grinding, turning, or drilling, as required by the particular product specification -- follows, and the parts are then glazed and fired in an oven at temperatures up to 2500 degrees Fahrenheit. Assembling metal fittings with the insulators completes the operation, where required.

RELATIVE IMPORTANCE OF RAW MATERIALS, LABOR, FUEL, AND FREIGHT COSTS

According to the 1958 Census of Manufactures, raw material cost (materials, parts, containers, supplies) amounted to 24.7 per cent of the value of shipments of Porcelain Electrical Supplies (SIC 3264) in 1958. Production wages accounted for 32.2 per cent, while other wages accounted for 11.3 per cent of the value of shipments of the industry. Fuel costs add an additional 2 to 5 per cent to shipment value for the year. Since porcelain

electric insulator shipments accounted for 66.5 per cent of the shipments of the Porcelain Electrical Supplies industry in 1958, the above percentages should be applicable to porcelain insulator production alone.

In addition, freight costs for shipping the products into the Southeast from the Midwest and Northeast add an extra 7 to 10 per cent to the basic cost.

From the above percentages, it is apparent that a sizeable reduction in raw material, labor, or fuel cost - particularly labor cost - for a given manufacturer would substantially reduce his cost of production. Similarly, a substantial reduction in freight cost on the final product would significantly reduce the delivered cost to the customers.

ADVANTAGES OF A GEORGIA LOCATION

The principal advantages for a Georgia plant to serve the southeastern market are:

- a. Lower production labor costs through lower wage rates and higher worker productivity than those existing in New England and midwestern plants.
- b. Lower freight costs on shipments of the finished products into the area.
- c. Lower freight costs on raw materials due to proximity of the plant to the source of supply.
- d. Improved service to customers because of the nearness of the plant to the customers served.
- e. Lower fuel costs.
- f. Improved sales position in the area because of the above advantages.

Lower Labor Cost

The unit production labor cost of a Georgia manufacturer can be significantly lower than that of northern competitors because of (1) substantially lower wage rates in the state, and (2) higher worker productivity, under conditions of good management.

Wage Rates

Average 1958 production wage rates for states producing a large volume

of the products are compared to the average southern wage rate in 1958 below:^{1/}

New York - - - - -	\$2.45 per hour
Ohio - - - - -	2.29 per hour
South - - - - -	2.07 per hour

Since the ratio of value of shipments to total production man hours for the industry in 1958 was \$6.613 per man hour, an Ohio manufacturer whose annual shipments into the Southeast amount to \$2 million would reduce his annual production costs \$66,535, based on the above wage differential alone, by producing the items in Georgia.^{2/} This reduction was computed as follows:

Number of production man hours required (for above shipments) =

$$\frac{\$2,000,000}{\$6.613} = 302,435 \text{ man hours}$$

Reduction in annual production wages (based on above wage differential) =

$$(\$2.29 - \$2.07) (302,435) = \$66,535$$

This amounts to a 3.3 per cent increase in net profit on sales of \$2 million.

Labor Productivity

A company which meets certain conditions can expect very high productivity from its Georgia employees. The prerequisites for obtaining maximum productivity from Georgia workers were established by a study by the Industrial Development Branch.^{3/} Among the requirements are an informed management, good personnel policies, utilization of local personnel in supervisory positions, reasonably stable production, and participation by the management in community activities. The experiences of many firms which have recently located in the state support this conclusion. National manufacturers of automobile parts, foundation garments, and paper products have found that their Georgia plants are significantly more productive than any of their other operations.

^{1/} Porcelain Electrical Supplies Industry (SIC 3264), 1958 Census of Manufactures.

^{2/} The Georgia wage rate would actually be somewhat lower than the average southern rate. Consequently, the savings would be greater than that indicated.

^{3/} See Charles Sewell, A Formula for Labor Productivity in Georgia, July, 1961.

Lower Freight Costs For Final Product

As an example of the reduction in freight cost on shipments of porcelain insulators that would occur as the result of a Georgia operation, the carload rail rates from manufacturers' locations in the North to seven southeast cities are compared with rates from Atlanta to the same southeastern locations.

Rail Freight Rates (in cents per cwt.) for Shipping Porcelain Insulators (30,000# minimum weight except as otherwise indicated)

<u>Destination</u>	<u>Origin</u>				
	<u>Atlanta</u> <u>Ga.*</u>	<u>Baltimore</u> <u>Md.</u>	<u>Barberton</u> <u>Ohio</u>	<u>LeRoy</u> <u>N.Y.</u>	<u>Trenton</u> <u>N.J.</u>
Atlanta	0.15	0.97	0.99	1.28	1.10
Birmingham	0.592	1.10	1.01	1.28	1.22
Columbia	0.681	0.81	1.03	1.17	0.93
Knoxville	0.633	0.83	0.81	1.05	0.95
Miami	1.16	1.40	1.77	1.88	1.64
Raleigh	0.896	0.625	0.93	0.95	0.73

* Effective incentive rate for shipping 30,000#

The average percentage reduction in freight cost on shipments from the Atlanta plant over the northern plants would be as follows:

Reduction in freight cost over Barberton plant = 37.1 per cent

Reduction in freight cost over Baltimore plant = 28.3 per cent

Reduction in freight cost over LeRoy plant = 46.0 per cent

Reduction in freight cost over Trenton plant = 37.4 per cent

As indicated in a preceding section of this report, freight costs on shipments of the products in the Southeast amount to 7 to 10 per cent of the value of shipments. Therefore, the reduction in freight costs available to several national manufacturers by having an Atlanta operation would be as follows (based on shipments into the area of \$2 million):

Present cost of freight = 0.07 (\$2 million) to 0.10 (\$2 million) =

\$140,000 to \$200,000

Savings available to:

Baltimore plant = (0.283) (\$140,000) to (0.283) (\$200,000) =
\$39,620 to \$56,900

Barberton plant = (0.371) (\$140,000) to (0.371) (\$200,000) =
\$51,940 to \$74,200

LeRoy plant = (0.46) (\$140,000) to (0.46) (\$200,000) =
\$64,400 to \$92,000

Trenton plant = (0.374) (\$140,000) to (0.374) (\$200,000) =
\$52,360 to \$74,800

Thus, the savings in freight would range from 2.0 per cent to 4.6 per cent of the value of shipments.

Lower Freight Costs for Raw Materials

Considerable savings would be realized in freight on shipments of raw materials. Three of the basic minerals comprising approximately 75 per cent (by weight) of the final product are mined in Georgia and shipped from this area to the northeastern and midwestern manufacturers. These are china clay (kaolin), feldspar, and talc. (See Figure 2.) In addition, ball clay is available in the adjoining state of Tennessee. Thus 75 to 85 per cent (by weight) of the raw materials required (depending upon the product mix for the specific insulator) is available within the Georgia-Tennessee area.

Proximity of Plant to Source of Raw Materials

There are, of course, other advantages to locating a plant near the raw material source. These include faster delivery of the material, smaller raw material inventory requirements and closer contact with suppliers.

Lower Fuel Cost

A Georgia plant would also enjoy lower fuel costs than present manufacturing establishments. The fuel used by most producers to fire the insulators is natural gas. Monthly fuel costs for plants located in Atlanta, Georgia, Baltimore, Maryland, and Barberton, Ohio for different volumes of gas consumption are compared below:

Average Monthly Fuel Costs

Monthly Gas Consumption Rate - 5 million cubic feet

	<u>General Service</u>	<u>Interruptible Service</u>
Atlanta Plant	\$2,371.50	\$1,462.80
Baltimore Plant	4,198.27	Not available for this volume
Barberton Plant	3,358.06	None

Monthly Gas Consumption Rate - 10 million cubic feet

Atlanta Plant	\$2,989.20 ^{1/}	\$2,925.60
Baltimore Plant	7,648.27	Normally not available for this volume
Barberton Plant	6,708.06	None

Monthly Gas Consumption Rate - 25 million cubic feet

Atlanta Plant	\$7,473.00 ^{1/}	\$7,314.00
Baltimore Plant	21,518.27	13,750.00
Barberton Plant	16,757.06	None

From these figures it can be seen that production at an Atlanta plant with a monthly consumption of 5 million cubic feet of natural gas would cost \$11,838 less annually in fuel cost than at a Barberton, Ohio, plant using the same volume of gas. The Atlanta plant would pay \$21,921 less annually than a Baltimore, Maryland, plant for the same amount of gas. If the monthly gas consumption of the local plant were 25 million cubic feet, the minimum yearly fuel savings compared to the Barberton and Baltimore plants using the same amount of gas would be \$120,692 and \$168,543 respectively.

Substantial savings in fuel cost are therefore available to a plant operating in the Atlanta area.

^{1/} Rate SN-9, Firm Gas Service.

Customer Service

Another significant advantage which would be gained by a plant established in Georgia to serve the southeastern market area is improved customer service. The proximity of the Georgia plant to its customers would provide faster delivery and closer contact with customers. This should prove to be a competitive advantage for the local plant.

The foregoing advantages should greatly improve a company's sales position in the southeast region.

CONCLUSIONS

The southeastern market for porcelain electric insulators is substantial - comprising 10.5 per cent of the national market in 1958. The competitive advantages available to a Georgia operator are also substantial. The most important of these advantages are significantly lower labor and freight costs, location near the raw material source, and improved customer service.

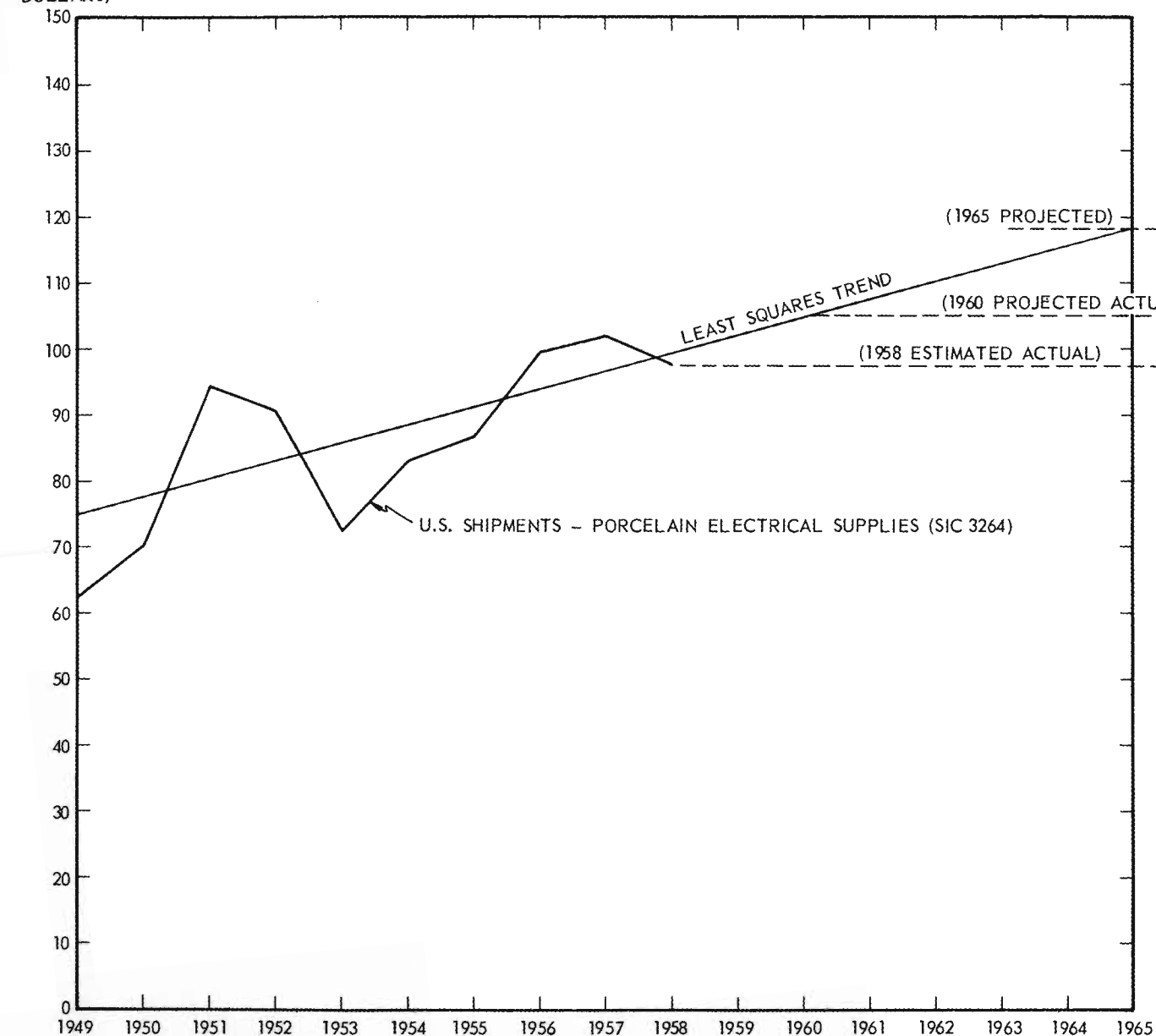
Because of the size of the regional market and the competitive advantages available to a Georgia producer, existing national manufacturers can expect an attractive profit from the manufacture of the products in this state.

APPENDIX 1

FIGURE 1

SALES TREND - PORCELAIN ELECTRIC INSULATORS - 6 SOUTHEASTERN STATES

(MILLIONS OF
DOLLARS)



(MILLIONS OF
DOLLARS)

SALES - PORCELAIN ELECTRIC INSULATORS - 6 S.E. STATES

APPENDIX 2

DATA COLLECTION

Total Sales of All Types of Porcelain Electric Insulators - Southeast

The 1958 sales figure for the six-state area was estimated from national shipments of the products as reported in the 1958 Census of Manufactures by the following formula:

$$\frac{\text{1958 Cost of Construction of Electrical Distribution Systems, 6 S. E. States}}{\text{1958 Cost of Construction of Electrical Distribution Systems, U. S. Total}} \times (\text{U. S. Shipments} - 1958) = \frac{\$144,746,196}{\$1,373,000,000} \times (\$60,595,000) = \$6,387,925$$

The 1960 and 1965 total sales figures for the area were projected from the 1958 estimate by applying the sales trend of the Porcelain Electrical Supplies Industry (SIC 3264) to the 1958 estimate. (See Figure 1.)

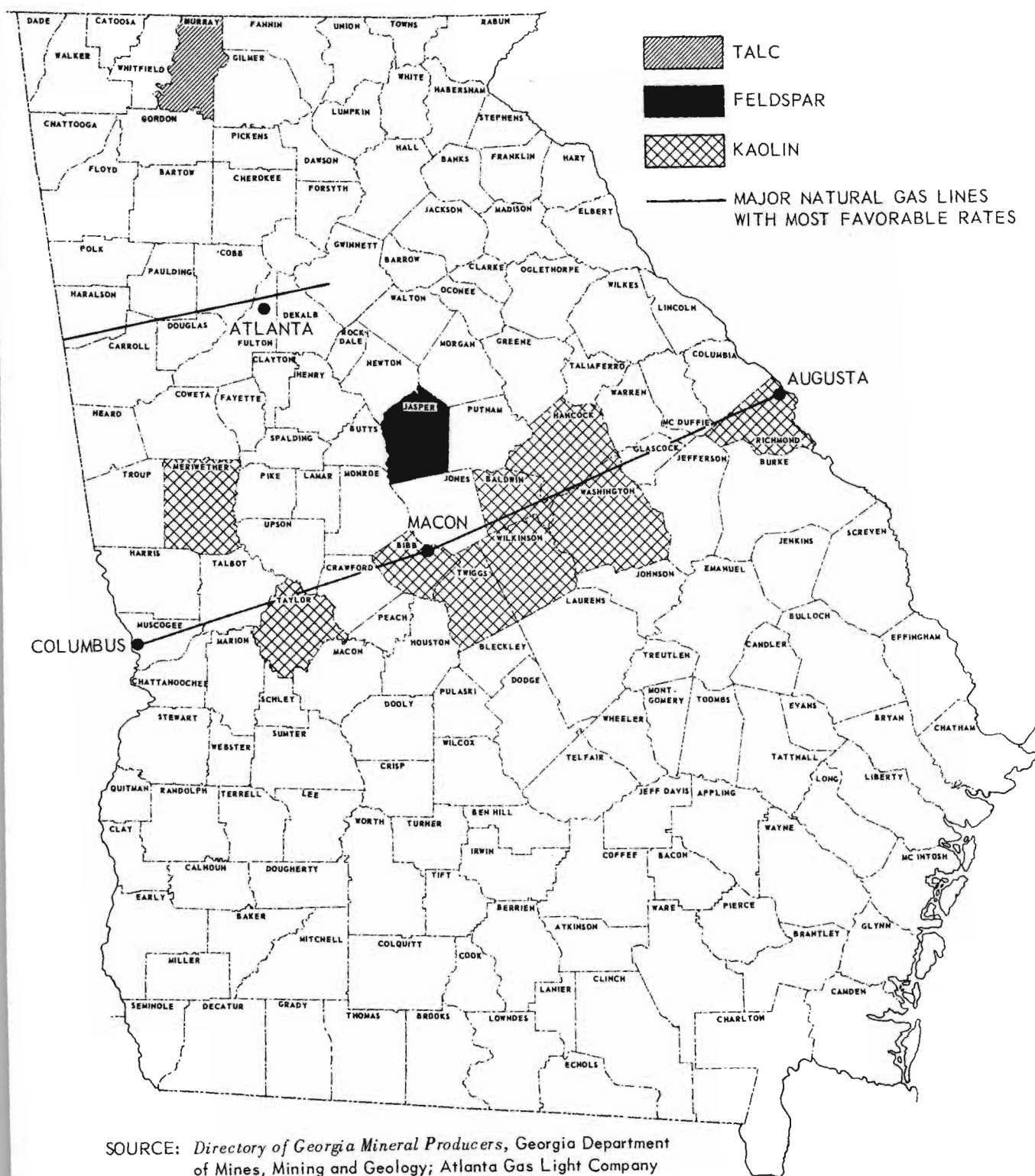
Sales of High Voltage Porcelain Electric Insulators

Sales for 1960 of these products were determined from two questionnaire surveys conducted by the Georgia Tech Industrial Development Branch. The first survey obtained data on the usage of the products by private electric utility companies, the Tennessee Valley Authority, and electric transformer producers in the six-state area. The second survey obtained usage data from all members of the Rural Electrification Administration (REA) in Georgia. From this figure estimates for REA members in the other five states were derived on the basis of the cost of construction of electrical distribution facilities by REA members in the five states by the following formula:

$$\frac{(\text{1960 Usage by Georgia Rural Electrification Administration})}{(\text{Construction Electrical Distribution Facilities} - \text{Georgia REA})} \times$$

(Construction Electrical Distribution Facilities by Alabama, Florida, North Carolina, South Carolina and Tennessee REA)

FIGURE 2
PORCELAIN INSULATOR RAW MATERIALS AND MAJOR NATURAL GAS LINES IN GEORGIA



SOURCE: *Directory of Georgia Mineral Producers*, Georgia Department of Mines, Mining and Geology; Atlanta Gas Light Company Rate Book.